

What is claimed is:

1. A method for analyzing an output signal matrix by comparison to an output signal matrix database, comprising:
 - (a) detecting a physical signal of each unit of a stimulated physical matrix comprising an ordered array of units having X and Y coordinates, each unit confining a different responder of a living thing comprising a plurality of different responders, or each unit confining a probe corresponding to said different responder, and an identifier for each said different responder or said probe, said living thing having been subjected to a stimulus affecting said different responder of a plurality of said units, said identifier providing a physical signal corresponding to the effect on said different responder;
 - (b) transducing each said physical signal to generate a corresponding electrical output signal;
 - (c) storing each electrical output signal in an output signal matrix data structure associating each output signal with the X and Y coordinates of the corresponding physical matrix unit of said stimulus; and
 - (d) determining the effect of said stimulus on said living thing by comparing the output signal matrix data structure of step (c) with an output signal matrix database.

1 2. The method of claim 1, wherein said output signal matrix database is produced by
2 a method comprising the steps:

3 (a) detecting a physical signal at each unit of a physical matrix comprising
4 an ordered array of units having X and Y coordinates, each unit
5 confining a different responder of a living thing comprising a plurality
6 of different responders, or each unit confining a probe corresponding to
7 said different responder, and an identifier for said different responder or
8 said probe, said living thing having been subjected to a stimulus affecting
9 said different responder of a plurality of said units, said identifier
10 providing a physical signal corresponding to the effect on said different
11 responder;

12 (b) transducing each said physical signal to generate a corresponding
13 electrical output signal;

14 (c) storing each electrical output signal in an output signal matrix data
15 structure associating each output signal with the X and Y coordinates of
16 the corresponding physical matrix unit of said stimulus; and

17 (d) repeating steps (a)-(c) to store output signal matrix data structures for a
18 plurality of stimuli to form an output signal matrix database.

1 3. The method of claim 1, wherein said affecting is repressing.

1 4. The method of claim 1, wherein said affecting is inducing.

1 5. The method of claim 1, said comparing step comprising comparing the output signal
2 matrix data structure of step (c) with said output signal matrix database according to
3 comparison rules in a knowledge database.

1 6. The method of claim 1, said comparing step comprising using a neural network
2 trained on said output signal database to compare the output signal matrix data
3 structure to said output signal database.

1 7. The method of claim 1, said physical signal being an optical signal.

1 8. The method of claim 1, wherein said array comprises a predetermined functional class
2 of said plurality of different responders or probes corresponding to said predetermined
3 functional class.

1 9. The method of claim 8, said functional class comprising a sufficient ensemble of all
2 different responders or probes corresponding to said different responders of said
3 living thing to deduce in said comparing step (c) a path by which said stimulus elicits
4 said output signal matrix data structure.

1 10. The method of claim 1, wherein said array comprises a majority of all different
2 responders, or probes corresponding to said majority of all different responders of
3 said living thing.

1 11. The method of claim 1, wherein said stimulated physical matrix comprises an ordered
2 array of units having X and Y coordinates, each unit confining a cell containing a
3 recombinant construct comprising a reporter gene, the expression of said reporter
4 gene being operatively linked to the expression of a different endogenous promoter
5 of a single organism comprising a plurality of different endogenous promoters, each
6 said cell having been subjected to a stimulus affecting the expression of said different
7 endogenous promoter in a plurality of said units, the expression of said reporter gene
8 providing a physical signal corresponding to the effect on the expression of said
9 different endogenous promoter.

1 12. The method of claim 1, wherein said recombinant constructs comprise a
2 predetermined functional class of said plurality of different endogenous promoters.

1 13. The method of claim 12, said functional class comprising a sufficient ensemble of all
2 said different endogenous promoters of said organism to deduce in said comparing
3 step (c) the path by which said stimulus elicits said output signal matrix data
4 structure.

1 14. The method of claim 11, wherein said recombinant constructs comprise a majority
2 of all said different endogenous promoters of said organism.

1 15. The method of claim 1, wherein said stimulated physical matrix comprises an ordered
2 array of units having X and Y coordinates, each unit confining a cell containing a
3 recombinant construct comprising a reporter gene, the expression of said reporter
4 gene being operatively linked to the function of a different endogenous protein of a
5 single organism comprising a plurality of different endogenous proteins, each said cell
6 having been subjected to a stimulus affecting the function of said different
7 endogenous protein in a plurality of said units, the expression of said reporter gene
8 providing a physical signal corresponding to the effect of the function on said
9 different endogenous protein.

1 16. The method of claim 15, wherein the expression of said reporter genes is operatively
2 linked to the function of a predetermined functional class of said plurality of different
3 endogenous proteins.

1 17. The method of claim 16, said functional class comprising a sufficient ensemble of all
2 said different endogenous proteins of said organism to deduce in said comparing step
3 (d) a path by which said stimulus elicits said output signal matrix data structure.

1 18. The method of claim 15, wherein the expression of said reporter genes is operatively
2 linked to the function of a majority of all said different endogenous proteins of said
3 organism.

1 19. The method of claim 1, wherein said stimulated physical matrix comprises an ordered
2 array of units having X and Y coordinates, each unit confining a hybridizer specific
3 for a different endogenous transcript of a living thing comprising a plurality of
4 different endogenous transcripts or cDNAs derived therefrom, said living thing having
5 been subjected to a stimulus affecting the expression of said different endogenous
6 transcript of a plurality of said units, said hybridizer providing a physical signal
7 corresponding to the effect on the expression of said different endogenous transcript.

1 20. The method of claim 19, wherein said hybridizers are specific for a predetermined
2 functional class of said plurality of different endogenous transcripts.

1 21. The method of claim 20, said functional class comprising a sufficient ensemble of all
2 said different endogenous transcripts of said living thing to deduce in said comparing
3 step (c) a path by which said stimulus elicits said output signal matrix data structure.

1 22. The method of claim 19, wherein said hybridizers are specific for a majority of all
2 said different endogenous transcripts of said living thing.

1 23. A method for generating an output signal matrix database useful for correlating
2 candidate stimuli and systemic responses, comprising:

- 3 (a) detecting a physical signal at each unit of a physical matrix comprising
4 an ordered array of units having X and Y coordinates, each unit
5 confining a different responder of a living thing comprising a plurality
6 of different responders, or each unit confining a probe corresponding to
7 said different responder, and an identifier for said different responder or
8 said probe, said living thing having been subjected to a stimulus affecting
9 said different responder of a plurality of said units, said identifier
10 providing a physical signal corresponding to the effect on said different
11 responder;
12 (b) transducing each said physical signal to generate a corresponding
13 electrical output signal;
14 (c) storing each electrical output signal in an output signal matrix data
15 structure associating each output signal with the X and Y coordinates of
16 the corresponding physical matrix unit of said stimulus; and
17 (d) repeating steps (a)-(c) to store output signal matrix data structures for a
18 plurality of stimuli to form an output signal matrix database.

1 24. The method of claim 23, wherein said affecting is repressing.

1 25. The method of claim 23, wherein said affecting is inducing.

1 26. The method of claim 23, said physical signal being an optical signal.

1 27. The method of claim 23, wherein said array comprises a predetermined functional
2 class of said plurality of different responders or probes corresponding to said
3 predetermined functional class of said plurality of different responders.

1 28. The method of claim 27, said functional class comprising a sufficient ensemble of all
2 different responders or probes corresponding to said different responders of said
3 living thing to deduce the path by which said stimulus elicits said output signal
4 matrix data structure.

1 29. The method of claim 23, wherein said array comprises a majority of all different
2 responders or probes corresponding to said majority of all different responders of said
3 living thing.

1 30. The method of claim 23, wherein said stimulated physical matrix comprises an
2 ordered array of units having X and Y coordinates, each unit confining a cell
3 containing a recombinant construct comprising a reporter gene, the expression of said
4 reporter gene being operatively linked to the expression of a different endogenous
5 promoter of a single organism comprising a plurality of different endogenous
6 promoters, each said cell provided a stimulus affecting the expression of said different
7 endogenous promoters in a plurality of said units, the expression of said reporter gene
8 providing a physical signal corresponding to the effect on the expression of said
9 different endogenous promoter.

1 31. The method of claim 30, wherein said recombinant construct comprise a
2 predetermined functional class of said plurality of different endogenous promoters.

1 32. The method of claim 31, said recombinant constructs comprise a sufficient ensemble
2 of all different endogenous promoters of said organism to deduce a path by which
3 said stimulus elicits said output signal matrix data structure.

1 33. The method of claim 30, wherein said recombinant constructs comprise a majority
2 of all different endogenous promoters of said organism.

1 34. The method of claim 23, wherein said physical matrix comprises an ordered array
2 of units having X and Y coordinates, each unit confining a cell containing a
3 recombinant construct comprising a reporter gene, the expression of said reporter
4 gene being operatively linked to the function of a different endogenous protein of a
5 single organism comprising a plurality of different endogenous proteins, each said cell
6 provided a stimulus affecting the function of said different endogenous protein in a
7 plurality of said units, the expression of said reporter gene providing a physical signal
8 corresponding to the effect on the function of said different endogenous protein.

1 35. The method of claim 34, wherein the expression of said reporter genes is operatively
2 linked to the function of a predetermined functional class of said plurality of different
3 endogenous proteins.

1 36. The method of claim 35, said functional class comprising a sufficient ensemble of all
2 different endogenous proteins of said organism to deduce a path by which said
3 stimulus elicits said output signal matrix data structure.

1 37. The method of claim 34, wherein the expression of said reporter genes is operatively
2 linked to the function of a majority of all different endogenous proteins of said
3 organism.

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